Tracking global research talent from the era of globalization to deglobalization

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1 Introduction

In this project, we use public ORCID biographies to reconstruct stocks and flows of research talent across the world. The data in ORCID is self-reported and requires additional analysis to infer a researcher's country of origin and to identify their career trajectory and mobility patterns. The advantage of ORCID biography data is that it allows us to measure collaborations via publications and the "quality" of publications in terms of citations and journal impact factors of the same researchers at different locations and periods of their career – dynamic measures of "talent" at work. We focus on the period from the early 2000s to late 2020s, observing both the period of increasing globalization of scientific mobility, and the more recent period of deglobalization and geopolitical tension.

The migration of talented individuals is central to the development and allocation of human capital, the production of science, and the spread of innovation. For researchers, mobility determines where high-potential individuals obtain training, which laboratories and firms recruit them, and whether knowledge generated in one country diffuses through international careers and collaborations [1–3] – operating under rules set by nation states with interests that go beyond the advancement of global scientific knowledge. The globalization that expanded scientific exchange, international graduate education, and cross-border research careers appears to be moving into a period of geoeconomic fragmentation, security concerns, sanctions, and strategic competition [4, 5]. Assessing the impact of these changes on production and diffusion of scientific knowledge requires accurate estimates of research-talent flows and stocks.

The main objective of this project is to develop the methodology for reconstructing global research-talent flows and stocks from ORCID biographies using publications and public CVs [2, 6] to measure the contribution of scientists as they change location over time. Where possible, the project will relate those changes to policy shifts in both sending and receiving countries, e.g. in the context of US-China relations [1, 7]. Finally, it will represent the global research-talent system as a network of countries connected by researcher flows.

The project puts ORCID data at the center of the analysis, because unlike the more commonly used affiliation data, ORCID CVs can also contain explicit education and employment entries.

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Building on earlier work [8], ORCID biographies will be used to construct longitudinal measures of where researchers are educated, where they work, when they move across borders, and when they return to their country of origin. Because the data are self-reported and do not contain explicit country of origin of each researcher, additional analysis is needed to infer the most likely country of origin for each researcher using information about their education and career trajectories, mobility events and individual characteristics.

Recent work on Chinese diaspora and returnee researchers and on US–China tensions illustrates how research mobility can be shaped by both origin-country scientific development and destination-country restrictions [1, 7]. ORCID-based stocks and flows will be used to describe and quantify these changes systematically across many countries to obtain measures of global shape of the flow of talent.

2 Methodology

A complete ORCID biography includes information on education, employment, and publications (works). While many records contain only partial information, to the extent possible, we will reconstruct education and employment spells, assign country locations to institutions, and infer each researcher's likely origin using alternative rules, such as country of earliest education, country of first observed affiliation, or other researcher-specific characteristics. When dates are available, the resulting panel will cover career histories from the early 2000s through 2025 and will let us produce researcher stocks and flows by origin country, destination country, year, career stage, and publication activity threshold. Because ORCID is self-reported and coverage varies across countries and cohorts, we will report all measures under multiple quality restrictions: complete date histories, identifiable institutional countries, plausible career ordering, and observable research activity. The following table shows the average career time span (in years) by profile quality tier defined based on the completeness of the ORCID biography.

Profile quality	count	mean	std	min	25%	50%	75%
Low	4,287,404	7.821	9.275	0.000	3.000	5.000	10.000
Medium	35,213	2.269	0.939	0.000	2.000	3.000	3.000
High	2,871,660	21.421	11.770	4.000	13.000	19.000	28.000

Table 1: Average career time span (in years) by profile quality tier.

We will use the resulting data to construct origin–destination–year matrices of researcher flows and stocks. We will also analyze return migration through additional matrices that identify the previous foreign host and the return country. We will construct separate matrices for student flows, first employment flows, researcher employment stocks, return flows, and career-stage-specific moves.

The matrix format will help us describe the global research-talent system as a network of countries connected by researcher flows and stocks. We will analyze the matrices to identify the most important corridors, the most central countries, and the degree of concentration or segmentation in the global system. We will use network methods to describe the structure of the global research-talent system, including measures of connectivity, reciprocity, clustering, modularity, and concentration. This will complement the more traditional gravity modeling approach, which we will use with traditional bivariate controls, such as distance, language, and historical links, to identify larger-than-expected flows and stocks.

We will focus validation on whether ORCID-derived flows capture meaningful variation, and we will benchmark aggregate ORCID measures against available external evidence on scientific mobility, researcher stocks, bibliometric affiliations, and recent estimates of scientist migration [6]. We will test robustness by excluding low-coverage country-years, requiring complete education and employment spells, using alternative origin definitions, reweighting by measured ORCID adoption, and restricting the sample to researchers with observable publication or research activity. The key advantage of ORCID is that it provides individual career histories rather than only aggregate migration stocks, allowing us to distinguish training, employment, return migration, and career-stage transitions.

The project fits the Economics of Talent agenda by measuring the international allocation of scientific human capital and the barriers that shape whether talented researchers can realize their potential. Its immediate output is a transparent empirical map of global research-talent flows before and after the shift toward deglobalization. Its broader contribution is to make those flows available for studying how mobility policies, scientific capacity, international networks, and geopolitical fragmentation affect the creation and diffusion of knowledge.

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